

### 3. Existing Conditions

Passenger travel in the East – West Corridor is primarily dependent upon the Massachusetts Turnpike / Interstate 90 (I-90), which is depicted in red in Figure 3-1 on the next page, the connecting highways and adjacent roadway networks. The vast majority of passenger trips in the Corridor are completed by private passenger car, some intercity bus travel (green), and Massachusetts Bay Transportation Authority (MBTA) commuter rail between Worcester and Boston as shown in Section 3.3, Travel Patterns.

#### 3.1. Existing Passenger Railroad Service

Passenger rail travel in the East – West Corridor is provided by frequent Commuter Rail service on the MBTA's Framingham/Worcester Line (purple) between Worcester and Boston. However, west of Worcester, passenger rail service in the Corridor is provided only by Amtrak's once-a-day *Lake Shore Limited* (blue) between Chicago and Boston. Within the East – West Corridor, the *Lake Shore Limited* provides service to Pittsfield, Springfield, Worcester, Framingham, and Boston.

Prior to 2004, passenger rail service between Springfield and Boston was also available via the "Inland Route," which was a branch of Amtrak's Boston – New York- Washington *Regional Service*. Prior to 2004, passenger rail service between Boston and New York City was provided via two branches – the Shore Line and the Inland Route – which diverged in New Haven. The Shore Line runs eastward from New Haven along the Connecticut coastline, before turning northward in southern Rhode Island and passing through Providence and southern Massachusetts en route to Boston. The Inland Route turned north from New Haven to Hartford and Springfield, then continued eastward to Boston via the Boston – Albany railroad mainline.

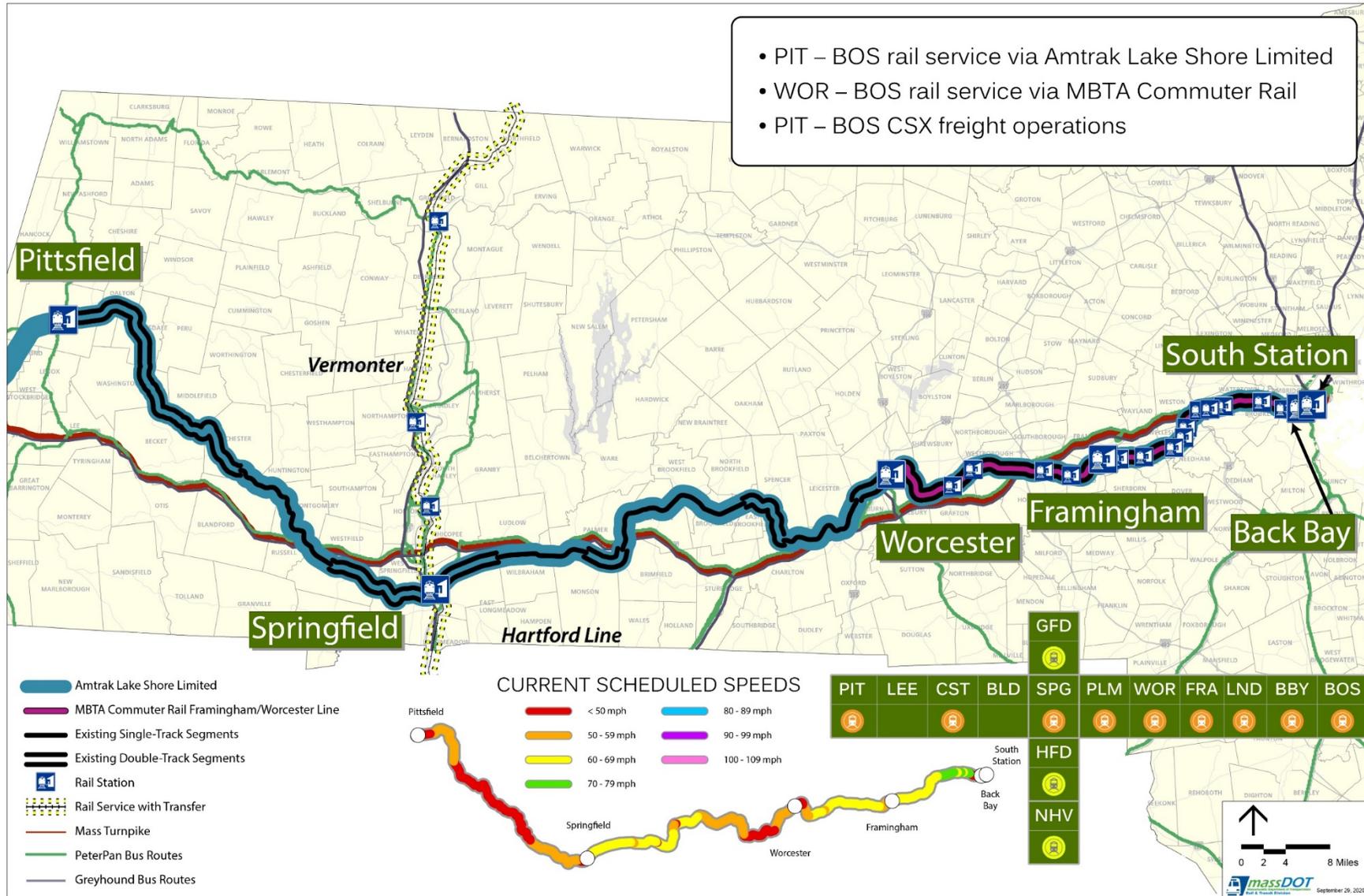
The Shore Line accommodates Amtrak's Northeast Corridor (NEC) *Acela* and *Regional Service* trains. Prior to 2000, the Shore Line

operated with diesel-powered trains between Boston and New Haven, with full electric service continuing west to New York. In 2000, the electrification of the Shore Line between New Haven and Boston was completed, and thereafter the entire Shore Line was operated exclusively by electric power. The electrification of the Shore Line had multiple benefits: it enabled the operation of Amtrak's new all-electric *Acela Express* trains and faster *Regional Service* trains; it eliminated the need for switching locomotives in New Haven, a time-consuming and disruptive operation; and it eliminated diesel emissions and local pollution impacts.

The Inland Route traveled northward from New Haven through central Connecticut and western Massachusetts, passing through Hartford and Springfield, then turned eastward and through Worcester and Framingham en route to South Station. With the electrification of the Shore Line in 2000, Springfield – Boston service along the slower Inland Route (2:05 hours longer from Boston – New York City) was gradually reduced with the last train discontinued in 2004.

The New Haven-Springfield portion of the Inland Route currently features passenger service via Amtrak's *Northeast Regional* service and the *Vermont* between Springfield and Washington, DC, as well as a total of 16 weekday round trips on Amtrak shuttle and CT *rail* Hartford Line trains between New Haven and Hartford or Springfield. The only passenger rail service on the east-west portion of the Inland Route between Springfield and Boston is Amtrak's *Lake Shore Limited* operating between Boston and Chicago, which provides one train per day in each direction.

Figure 3-1 – East – West Corridor Multimodal Transportation Map



Although Amtrak has not operated passenger service between New Haven and Boston via the Inland Route since 2004, the corridor can provide redundancy in the event of an emergency or major construction along the NEC. When NEC service was completely suspended during the replacement of the Thames River Bridge in 2008, Amtrak provided reduced service levels between Boston and New York City by operating three round trips per day along the Inland Route.

### 3.2. Railroad Operating and Regulatory Issues

The railroad network in Massachusetts has a mix of ownership, both public and private. The rail lines that are owned publicly by the MBTA and MassDOT are used primarily for passenger commuter rail and intercity rail operations, but freight railroads also have a “right of access” to operate over these lines to serve their customers. These rights of access are a function of freight railroads’ Common Carrier obligations, as initially defined through the Interstate Commerce Act of 1887, subject to operational coordination with the rail owner. Conversely, passenger railroads can gain operating rights over freight railroads, subject to coordination and operating agreements; for example, Amtrak has operating rights over the CSX-owned Boston – Albany main line to operate the Lake Shore Limited.

The Rail Passenger Service Act of 1970 created the National Railroad Passenger Corporation (known as “Amtrak”) as a quasi-public, financially independent entity to provide nationwide passenger rail service. This law provided Amtrak with rights of access to operate over freight lines, and established a “Basic System Plan” of defined routes that required freight railroads to maintain these routes to prescribe a “Level of Utility”. All other routes not included in Basic System Plan are subject to separate agreements to establish speed and maintenance standards.

### Passenger and Freight Shared Use Operations

Passenger and freight shared-use rail operations create challenges for scheduling, dispatch, and the need for suitable track infrastructure and signal equipment. Shared use operations that add passenger service to freight rail lines often require investment to install some combination of double-tracking, passing sidings, new track, and higher-capacity signal systems.

Passenger trains operate at higher speeds, which requires the track structure, signal system, and roadway crossing infrastructure be designed and maintained to support faster operations. The Federal Railroad Administration (FRA) has established maintenance standards and other speed-related regulatory requirements that railroads must comply with, or the passenger service must be curtailed or reduced to operate at a much slower speed. The frequency and comprehensiveness of inspections of the infrastructure is also proportionate to the maximum speed in the territory. Both the additional maintenance efforts and more intensive inspections are intrinsic to operating the trains at higher speeds. The costs of these additional activities must be accounted for in the development of the passenger service plans.

A shared-use operation complicates line capacity utilization, particularly with intercity passenger trains involved. Average intercity passenger train speed typically considerably exceeds freight train average speeds, which causes “overtake” conflicts and exacerbates the difficulty in prioritizing passenger operations without causing adverse impacts to freight service. In Massachusetts, current and approved shared use corridors provide enough capacity for near-term needs. It is important that any future shared use of these corridors conforms to the principle of providing sufficient capacity.

## Passenger Train Classes

Passenger rail service can generally be classified as either commuter rail or intercity passenger rail, which in turn has different levels of service. All of these types of service can be found in the East – West study corridor, although high-speed intercity service operates only peripherally in the corridor.

- **Commuter Rail:** Commuter rail service is a more frequent type of service that connects many urban and suburban stations to a large city center, with a range that corresponds to the size of the central city. As the name implies, a high proportion of riders are typically commuting daily to jobs in the city center. The MBTA operates commuter rail service on the Worcester/Framingham line between Worcester Union Station and Boston South Station. This service operates with high frequency, station stops 1 to 5 miles apart, and maximum runs of 30 to 45 miles and maximum speeds of 80 mph. The CT *rail* Hartford Line is also commuter rail service. Commuter rail services typically receive public financial support to offset from 25% to 75% of the service's operating costs.
- **Intercity Passenger Rail:** Intercity passenger rail provides connections among different urban centers, with wider stop spacing and lower frequency than commuter rail. Amtrak is the principal national operator of intercity passenger rail in America, though there are some state and quasi-public entities that also directly operate or manage operation of the regional intercity services.
  - **High-Speed Intercity Service**, such as the Amtrak *Acela Express*, operates with frequent service, station stops 30 to 50 miles apart, a maximum line distance of 500 miles, and a top speed of 160 mph. The highest portion of travel is business travel. This type of service only briefly shares tracks with the East – West Corridor between Back Bay Station and South Station in Boston.

- **Regional Intercity Service** operates with moderate frequency, station stops 10 to 50 miles apart, maximum runs of 700 miles, and a maximum speed of 125 mph. A high proportion of trips are for business and personal/recreational travel. Of the rail services in the East – West corridor, only the Washington, DC to St. Albans, VT *Vermont* service and 9 Regional Service roundtrips serving Back Bay and South Station are regional intercity service. A new East-West service would also fall within this category, as would the Boston North Station–Portland–Brunswick, ME *Downeaster* service discussed in this study.
- **Long-Distance Intercity Service** operates less frequently (with only one or a few daily trips, station stops 15-75 miles apart, and maximum runs of 2,800 miles and maximum speeds up to 110 mph. A high proportion of passengers use these services for personal/recreational travel. The Amtrak *Lake Shore Limited* is an example of a long-distance intercity service.

## Passenger Service Funding

As noted above, the Rail Passenger Service Act of 1970 created Amtrak as a financially independent entity. Amtrak receives Congressional funding for some capital and operating costs, but it is also responsible for covering costs through passenger fares. As part of Amtrak's legislatively-defined Long-Distance system, the *Lake Shore Limited* operating expenses are absorbed by Amtrak, whereas both the *Vermont* and Amtrak-operated trains on the Hartford Line and the *Valley Flyer* service are classified as "state-supported." These services receive financial assistance from the states along their respective routes.

## Railroad Infrastructure

The following are definitions of a few specialized railroad infrastructure terms that are used in the following sections.

- **Railroad Bridges.** Railroad bridges are a critical component of rail infrastructure that separate railroad operations from conflicts with obstacles such as water bodies or other transportation links, such as roadways or other railroads. The relative vertical position of railroad bridges is also categorized as “undergrade” or “overhead” from the perspective of the train.
  - Undergrade bridge. The railroad passes over an obstacle, such as a roadway or water body.
  - Overhead bridge. The railroad passes underneath a bridge, such as a roadway viaduct.
- **Grade Crossing.** A railroad grade crossing is a location where a railroad and a roadway intersection “at-grade,” that is, at the same level. Grade crossings, both for public and private roadways, can affect the safety and efficiency of freight and passenger rail service. Warning devices are employed at many at-grade crossings to identify the presence of the grade crossing. This equipment may include passive signage such as crossing crossbucks, or active systems, such as flashing lights and auditory signals, as well as active barrier, gates that are lowered when a train is approaching. New installations can now include vehicular and pedestrian intrusion warning systems.
- **Interlocking.** An interlocking is a system of railroad infrastructure, such as a junction or crossing, along with associated signals and switches, that enable trains to change tracks or cross other railroad tracks in a manner that is controlled and safe. PTC provisions have added additional safety elements to control these movements.

### 3.3. East – West Corridor Transportation System

The following is a summary of the key elements of the transportation system that serves the East – West Corridor, with a particular focus on the rail line connecting the East – West Corridor communities.

**Pittsfield – Boston Rail Line.** The East – West Rail Corridor between Pittsfield and Boston is served by CSX Transportation (CSX), the MBTA Commuter Rail Framingham/Worcester Line and Amtrak. This section identifies all major physical, regulatory, and ownership opportunities and constraints, as well as recent changes, along the Corridor. The key metrics for the Corridor are divided among the Corridor’s three main segments: the CSX-owned track from Pittsfield to Springfield and from Springfield to Worcester, and the MassDOT-owned segment between Worcester and Boston.

- **Rail Line Ownership and Control.** CSX is the largest freight railroad operating in Massachusetts and the largest private owner of rail property; CSX owns the 100-mile segment of the East – West Rail Corridor between Pittsfield and Worcester. A 2012 agreement transferred ownership and control of the balance of the corridor, from Worcester to South Station in Boston, from CSX to the Commonwealth of Massachusetts. As part of the agreement, MassDOT and CSX collaborated on track and bridge improvements to provide full double-stack vertical clearance (Plate H, 20’ 2”) between the New York State line and a newly-expanded intermodal terminal in Worcester, reducing transit times by as much as 24 hours. In addition to the mainline improvements, CSX has made an investment of over \$100 million in intermodal facilities in Worcester, West Springfield and Westborough that greatly benefit the Massachusetts economy. These investments have expanded intermodal rail access to Massachusetts for freight shippers and improving the competitiveness of freight rail in the Commonwealth. CSX continues to provide local freight service to Boston, and through Mansfield to South Coast destinations. The 2012 ownership transfer of the Worcester – Boston section to MassDOT enabled a large-scale expansion of MBTA service as well as expansion of the infrastructure such as the 3<sup>rd</sup> Main Track project and Allston (Beacon Park) re-development. The

Commonwealth’s acquisition and investment was the catalyst to advancing the work.

- **Track and Right-of-Way Conditions.** Between Pittsfield and Boston, the East-West Corridor spans a total of 151 route miles. In general, the width of the railroad right-of-way decreases as one move from west to east; the western segment is up to 150 feet wide, while the heavily-developed eastern segment can be as narrow as 50 feet, as shown in Table 3-1. At one time the line had two or more main tracks for the entire length. Western sections were single-tracked in the 1980s to help reduce the costs of replacing an obsolete signal system and rail infrastructure. The line is currently considered to be well-maintained by CSX and is the only route east of the Hudson River capable of hosting 315,000-lb. freight cars, the heaviest in general use in the industry.

*Table 3-1 –Track and ROW Conditions by Major Segment*

SEGMENT	CORRIDOR WIDTH (FT)	SEGMENT LENGTH (MI)	DOUBLE-TRACKED (MI)	PASSENGER SPEEDS (MPH)	PERCENT AT MAX SPEED
PIT – SPG	100-150	52	38.5	30-50	47%
SPG – WOR	80-100	54	21	25-60	45%
WOR – BOS	50-80	44	44	25-79	11%

- Maximum authorized and average passenger speeds decrease as one moves east to west due to sharp track curvature and the difficult topography of the Berkshires and its river valleys.
- The Pittsfield to Springfield section offers the widest right-of-way (ROW) but passage alongside the Westfield River, declared a part of the National Wild and Scenic River System, effectively prevents utilizing much of it. Maximum and average passenger speeds along the Springfield to Worcester segment are higher, but still constrained by engineering maintenance

criteria to support the very heavy freight volumes, as well as sharp curvature just west of Worcester in Leicester and Charlton.

- The central section of the corridor historically featured two or more tracks and typically offers 80 to 100 feet of width, with occasional segments between 100 and 150 feet wide.
- The highest maximum and average passenger speeds are attained along the passenger-heavy, fully double-tracked, less curving segment between Worcester and Boston, which permits passenger trains to travel up to 79 mph in sections. Most of the railroad alignment east of Worcester has right-of-way between only 50 and 80 feet wide.
- **Geometric Challenges and Operational Obstacles.** The topography of the terrain surrounding the rail alignment shapes the railroad geometry, which has a major influence on train speed. In addition to potential geometric issues, the presence of bridges and interlockings requiring diverging operations can also affect the ultimate performance and/or deliverability of a potential passenger service. Depending on the maximum operating speed desired, the presence of sharp horizontal curves (i.e., those greater than 2 degrees 30 minutes) may serve to limit the maximum speeds that can safely be achieved. Similarly, steep slopes in either direction (absolute vertical grades of one percent or greater) can negatively impact the potential speed of rail operations, especially freight operations. These constraints ultimately determine the rail corridor’s horizontal and vertical alignments and can make it economically difficult to significantly increase maximum speeds.
  - As seen in Table 3-2 on the next page, the Pittsfield to Springfield segment has the highest density of sharp horizontal curves. These curves are to traverse the significant grades formed by the Berkshire Mountains, which carry the railroad alignment to a maximum elevation of 1,460 ft above sea level in the Town of

Washington. The curves enable the railroad alignment to follow lower grades that cannot be achieved by only following a straight track alignment. Multiple sharp curves cannot be avoided in this segment. Notably, the railroad alignment crosses the Westfield River 22 times in this section to maintain reasonable grades.

- o From Springfield to Worcester, the Corridor is more level and features fewer horizontal curves less than five degrees; most of those sharp turns are located in Charlton or Spencer. In this section of the corridor, there are nine major bridges over the Quaboag River and several smaller bridges over other waterways.
- o The Worcester to Boston segment is comparatively straight and unimpeded, with only five bridges over the Charles River, Muddy River and Sudbury River.

Table 3-2 – Geometric Challenges and Obstacles by Major Segment

SEGMENT	SHARP CURVES (> 2°30')	STEEP SLOPES (> 1%)	BRIDGES (UNDERGRADE / OVERHEAD)	INTER-LOCKINGS
PIT – SPG	59	6	67 (50 / 17)	9
SPG – WOR	20	1	84 (50 / 34)	14
WOR – BOS	21	0	100 (27 / 73)	16

- **Grade Crossings.** Railroad grade crossings are critical to the safety of the rail line and the roadways that cross it. The fewer grade crossings, and the greater the level of protection at the grade crossings that do exist, the lower the risk of collisions. Grade

crossings by type along each of the three major Boston – Albany mainline rail segments are shown in Table 3-3.

Table 3-3 – At-Grade Crossings by Major Segment and Type

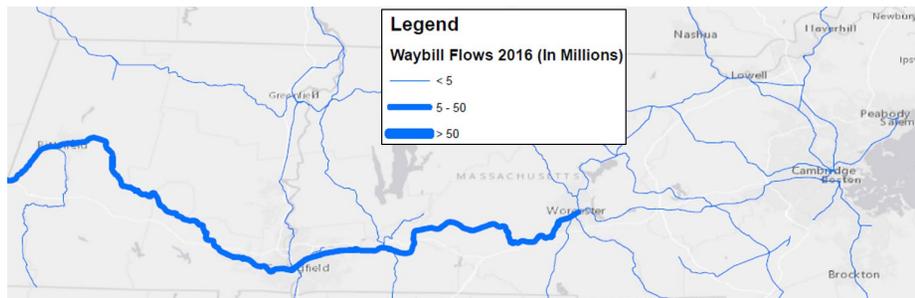
SEGMENT	PUBLIC	PRIVATE	PEDESTRIAN	TOTAL
PIT – SPG	5	15	1	21
SPG – WOR	0	7	0	7
WOR – BOS	4	1	5	10
<b>TOTAL</b>	<b>9</b>	<b>23</b>	<b>6</b>	<b>38</b>

- **Passenger Rail Capacity and Demand.** The MBTA operates 27 weekday round trips on the Framingham / Worcester Commuter Rail Line, with 20 of those round trips providing service west of Framingham to the western terminus at Worcester Union Station, while Amtrak operates one 1 daily round trip between Boston and Albany / Chicago. East of Worcester, the MBTA's preliminary analysis of capacity along the Worcester Line indicates that any increase in peak service would require implementing the Worcester Triple Tracking project described above. At the line's eastern terminus, South Station is already at capacity during peak hour service and will remain heavily constrained until MassDOT implements the South Station Expansion project. In addition to expanding terminal capacity to meet future high-speed, intercity, and commuter rail service needs, this effort would also increase layover capacity on the eastern end.
- **Freight Rail Capacity and Demand.** Shipping freight by rail rather than by truck reduces truck traffic and highway congestion, reduces greenhouse gas emissions by an estimated 75 percent,<sup>2</sup> and provides an additional shipping option for Massachusetts businesses. The segment of the Boston Main Line between

<sup>2</sup> Association of American Railroads, "Freight Rail & Preserving the Environment," July 2020.

Pittsfield and Worcester constitutes a core route for CSX's system freight movements, and freight rail demand in the corridor is likely to increase, consistent with projections that overall freight movement in Massachusetts is expected to increase by 31 percent between 2013 and 2040.<sup>3</sup> The CSX freight line is one of the few freight railroad lines in Massachusetts that can handle the current freight rail industry standard of 286,000 lb. railcars, and the only one capable of handling 315,000 lb. railcars. In 2018, CSX regularly operated 14 through freight trains each day, along with additional freight trains based on shipper demand and locals. CSX has handled approximately 140,000 freight loads per year in the Worcester intermodal facility, either originating from or destined to Commonwealth customers. Waybill sample data for 2016 confirms that the CSX mainline between the New York State line and Worcester carries by far the most tonnage of any rail line in Massachusetts and within New England, as shown in Figure 3-2.

Figure 3-2 – 2016 Freight Rail Volumes (FRA Waybill Sample Data)



- **Positive Train Control (PTC).** PTC is a rail safety overlay system that works with on-board train control and railroad signal and communication systems to prevent trains from colliding, operating

at excessive speeds through curves, and provide worker protection when track construction or maintenance is underway. PTC provides additional operational safety features and only moderately changes the design, operational speed, or capacity of the existing system. CSX and the MBTA have implemented two different PTC systems for their respective areas of jurisdiction; CSX has implemented the Interoperable Electronic Train Management System (I-ETMS) between Pittsfield and Worcester, while the MBTA uses the Advanced Civil Speed Enforcement System (ACSES) between Worcester and Boston. CSX, the MBTA, and Amtrak have completed implementation of the infrastructure and operating systems required for PTC, and expect their systems to be fully operational by the end of 2020. For any trains operating in both CSX and MBTA jurisdictions, the locomotive will need both systems to safely operate. This includes both passenger trains operating west of Worcester and freight trains operating east of Worcester.

- **Passenger Rail Stations.** The large cities on the East – West Rail Corridor – Pittsfield, Springfield, Worcester, and Boston (3 stops) – currently have passenger rail stations that could be served by East – West trains, although some would require improvements. Two other potential station locations, Chester and Palmer, had train stations along the rail line in the past, but those are no longer extant and would require new stations. Amtrak's long-distance *Lake Shore Limited* intercity service between Boston and Chicago has stops in Pittsfield, Springfield, Worcester, Framingham, and Boston. Additional stations along the Worcester to Boston segment are used by MBTA, with local and express commuter rail service between those cities and numerous intermediate points.

<sup>3</sup> Freight Analysis Framework (Bureau of Transportation Statistics/ Federal Highway Administration), per 2018 *Massachusetts State Rail Plan*.

South Station and Worcester Station are the terminal stations of the segment, and the terminal stations for current MBTA commuter rail service. Table 3-4 on the following page provides key information for each of these stations related to platforms, ownership of the various elements, on-site parking capacity, ADA accessibility, and connections to other public transportation services. These represent current conditions, and do not necessarily reflect future conditions that would be in place when an East – West passenger rail service would be in operation.

- **Joseph Scelsi Intermodal Transportation Center (ITC)** is a transportation facility located in downtown Pittsfield, Massachusetts. The ITC is served by Amtrak's Lake Shore Limited service and is owned and managed by the Berkshire Regional Transit Authority (BRTA). The ITC provides a waiting area for passengers who then descend to track level to board their trains. There is a one low level side platform facing one of the line's two tracks. Accessible platforming is provided by wheelchair lift. Amtrak does not provide ticketing or baggage service at the station. The ITC is also served by Greyhound and Peter Pan intercity buses and local BRTA buses. Parking is available at a 132-space parking lot.
- **Chester** has a former station building located on Prospect Street in the town center, but there is currently no active station facility and no passenger rail service. The historic station building now houses the Chester Railway Museum, which is owned and managed by the Chester Foundation Inc. Two CSX-owned railroad tracks pass to the west of the historic station building; there are no remaining platforms at the site.
- **Springfield Union Station**, in downtown Springfield, is served by Amtrak's *Lake Shore Limited*, *Vermont*, New Haven to Springfield Shuttle, and limited *Regional Service* trains as well as the CT *rail* Hartford Line commuter service. The station is owned and managed by the Springfield Redevelopment

Authority. The station has four low-level platforms that are accessible by wheelchair lift and a new high-level boarding platform, which opened in early 2020, that provides a fully ADA-compliant platform. Plans to add additional high-level platforms have been developed. The City of Springfield demolished the large abandoned baggage/station building on the north end of the site, and in 2017 completed the construction of a large parking garage with 377 parking spaces and a 24-bay bus terminal on the site. The station is served by Greyhound and Peter Pan intercity buses and PVTA local buses.

- **Palmer** historically had a station located in the town center east of the intersection of the CSX and NECR mainlines. The station was abandoned and the old station building now functions as a restaurant. Three tracks are located to the north and one to the west of the historic station. Currently there is no active station facility, and the location is not served by passenger rail service. The Amtrak *Lake Shore Limited* service passes through Palmer but does not stop. The station site is located on right-of-way owned by CSX. There is also an important interlocking which has its switching and signal facilities within the Palmer station site. This arrangement that did not exist when the station was originally constructed and will substantively complicate the siting of a new station in the same location.
- **Worcester Union Station** is a passenger rail station located in downtown Worcester at Washington Square. The station is served by MBTA's Framingham/Worcester Commuter Rail Line and Amtrak's Lake Shore Limited service. The station is owned and managed by the Worcester Redevelopment Authority. The station features a high-level platform on one side, which is compliant with the Americans with Disabilities Act of 1990 (ADA), large headhouse with passenger waiting and

ticketing areas, retail and food vendors, and public safety facilities. A central high-level boarding platform is currently in design to further improve the ADA accessibility requirements and to improve the operational capabilities. The station has a

500-car garage. The station is also served by Greyhound and Peter Pan intercity buses, Worcester Regional Transit Authority local buses, and shuttles affiliated with nearby institutions.

Table 3-4 – Passenger Rail Stations: Boston to Pittsfield

COMPONENT / STATION	PITTSFIELD	CHESTER	SPRINGFIELD	PALMER	WORCESTER	FRAMINGHAM	BACK BAY	SOUTH STATION
PLATFORM TYPE	Low level	N/A	Low level	N/A	High Level (1 side)	Low and Mini High Level	High Level	High Level
OWNERSHIP								
FACILITY	BRTA	N/A	Amtrak	N/A	WRA	MBTA	MBTA	MBTA
PLATFORM	BRTA	N/A	Amtrak, CSX	N/A	WRA	MBTA	MBTA	MBTA
TRACK	CSX	CSX	Amtrak, CSX	Amtrak, CSX	WRA	MBTA	MBTA	MBTA
PARKING	City of Pittsfield	None	Springfield Redevelopment Authority	N/A	City of Worcester	MBTA	N/A	N/A
PARKING	132	N/A	377	N/A	500	166	None	226
ACCESSIBILITY	Platform, wheelchair lift	N/A	Platform, restrooms, waiting room, wheelchair lift	N/A	Platform, restrooms, waiting room	Platform	Platform, restrooms, waiting room	Platform, restrooms, waiting room, ticket office
CONNECTIONS	BRTA and intercity bus	N/A	CTrail/Hartford Line, Vermonter, NE Regional, PVTA bus, intercity bus	N/A	MBTA commuter rail, WRTA bus, and intercity bus	MBTA commuter rail, and MWRTA bus	MBTA subway/bus/commuter rail	MBTA subway/commuter rail, and intercity bus

- **Framingham Station** is a passenger rail station located at the intersection of Irving and Concord Streets in Framingham, Massachusetts. The station is served by MBTA's Framingham/Worcester Commuter Rail Line and Amtrak's *Lake Shore Limited*, and is owned and managed by the MBTA.

Framingham Station has two low-level, at-grade platforms, with access from various points on surrounding streets, and a mini-high platform for each of the two tracks. The station meets ADA accessibility requirements. The station has a 166-space

parking lot, and connections with local bus service and shuttles.

- **Back Bay Station**, in the Back Bay neighborhood of Boston, is served by three Amtrak services and four MBTA commuter rail routes. The station is owned and operated by MBTA. Back Bay Station has five rail tracks and three platforms used by Amtrak and MBTA Commuter Rail trains. Additionally, the MBTA Orange Line rapid transit service has two tracks and one center island platform. Local buses utilize a bus loop located on the eastern side of the station. Private shuttle buses also serve the station. The station is ADA compliant, with fully accessible platforms and trains.
- **South Station** in downtown Boston is the largest passenger rail station in New England, serving three Amtrak services, eight MBTA Commuter Rail routes, and the seasonal *CapeFlyer* passenger rail service to Cape Cod. The MBTA owns and maintains the transportation facilities at South Station; Beacon Management owns and operates office space at the station. The station has thirteen tracks and seven platforms, passenger waiting and ticketing facilities, retail and food vendors, and public safety facilities. It is also a major intermodal hub, with connections to the Red Line and Silver Line rapid transit lines, local bus routes, private shuttle bus routes, and intercity bus lines. In 2012, South Station served roughly 128,000 daily boardings and alightings, including Amtrak, MBTA Commuter Rail, Red Line, Silver Line, local bus, and intercity bus passengers. The station meets ADA accessibility requirement, with fully accessible, level-boarding platforms and elevators. Parking is available at the South Station Bus Terminal garage, located over the southern part of the site. The South Station rail terminal currently operates at capacity during peak hours, and the South Station Expansion

project is required to accommodate additional passenger rail service.

- **Environmental and Regulatory Constraints.** Historic railroads running through hilly or mountainous terrain frequently follow river valleys to maintain their grade where possible. In the East-West Corridor, much of the Boston-Albany mainline follows such river valleys. Between Pittsfield and Springfield, much of the alignment follows the Westfield River, which is afforded special protections under the National Wild & Scenic Rivers System program; east of Springfield, it follows the Quaboag River. Major changes or upgrades along the Corridor would have impacts to these protected resources, as well as the adjacent communities. Thus, rail corridor improvements for the East-West Passenger Rail Service would require regulatory review and permitting at the federal, state, and local level, particularly for work outside of the immediate railroad ROW. Given the length of the Corridor, increasing passenger rail speeds would likely to require infrastructure improvements that would trigger a NEPA filing beyond a Categorical Exclusion, along with various state and local permits.
- **Operating Rights and Contractual Restrictions.** Much of the freight rail system operates on legacy corridors that are shared by commuter and/or intercity rail passenger rail service for at least a portion of the route. Shared-use rail operations create challenges for operational capacity; scheduling and dispatch; the need for suitable track infrastructure (e.g. double-track and passing sidings) and signal equipment; and speed mismatches between slower freight trains and faster passenger trains. The principal conflict with shared corridors comes when the combined use by passenger and freight rail operators exceeds line capacity, including any capacity the freight railroad has reserved that is necessary for it to achieve its growth plans. Nevertheless, under federal law, Amtrak has the right to provide passenger service on

freight-owned lines, while the host railroad has the right to set the terms for an operating agreement. MBTA and MassDOT are not eligible to directly utilize these legal provisions.

**Highway Network.** The main highway connection for the East – West Corridor is the I-90 corridor / Massachusetts Turnpike. This express highway runs principally east – west across Massachusetts and provides access to all the Corridor communities, either directly or via a connecting highway.

As shown in Figure 3-3, automobile volumes along I-90 increase as one moves eastward towards Boston. Beginning near Pittsfield and Lee, directional Annual Average Daily Traffic (AADT) volumes increase around Springfield, abruptly rise at the I-290/395 exit in Auburn/Worcester, gradually increase through the communities of MetroWest, and reach a peak between Route 128 and the interchange serving Allston, Brighton, and Cambridge, beyond which traffic volumes drop off. For Springfield and Worcester, the congested highways connecting the urban centers to I-90 serve more vehicles than I-90 itself.

This building congestion as one moves east on I-90 has significant impacts on travel speeds and reliability of travel times. Based on projections of 2040 travel times from the Massachusetts Statewide Travel Demand Model, the effects of this congestion were assigned a “peak direction travel time factor.”

Table 3-5 shows these factors for origin – destination pairs of the major cities in the East – West Corridor. These factors give the average amount by which the travel time for that trip increases during peak period congestion, compared with off-peak, uncongested conditions). For example, in 2040, an automobile trip from Pittsfield to Springfield during the morning peak period (which would be the peak congested direction) is expected to take 1.12 times as long as during

uncongested conditions, while the afternoon peak period trip from Boston to Worcester would 2.39 times as long as an uncongested trip.

Figure 3-3 – Traffic Volumes (AADT) at I-90 Interchanges (MassDOT, 2018 Road Inventory)

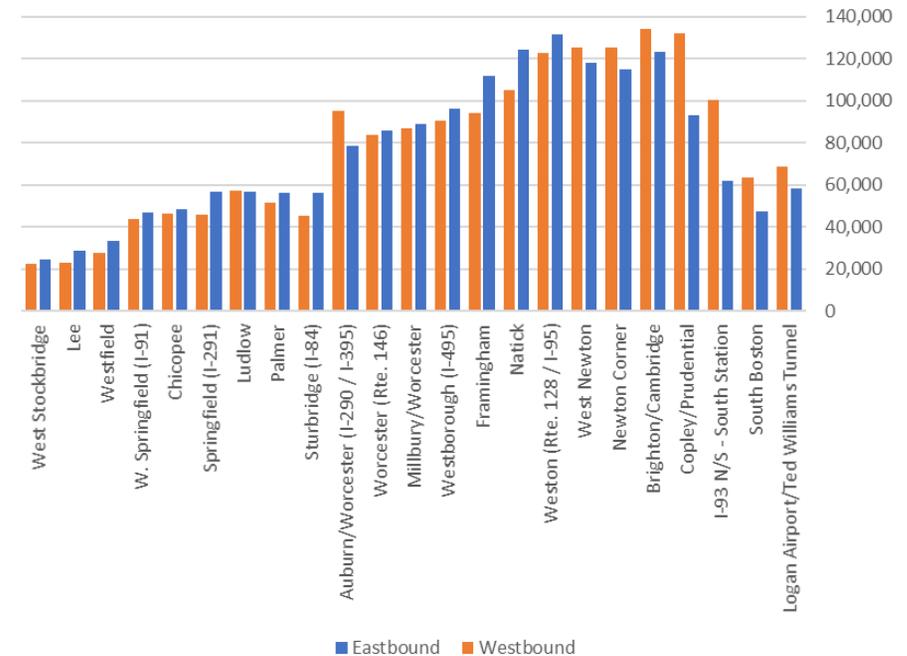


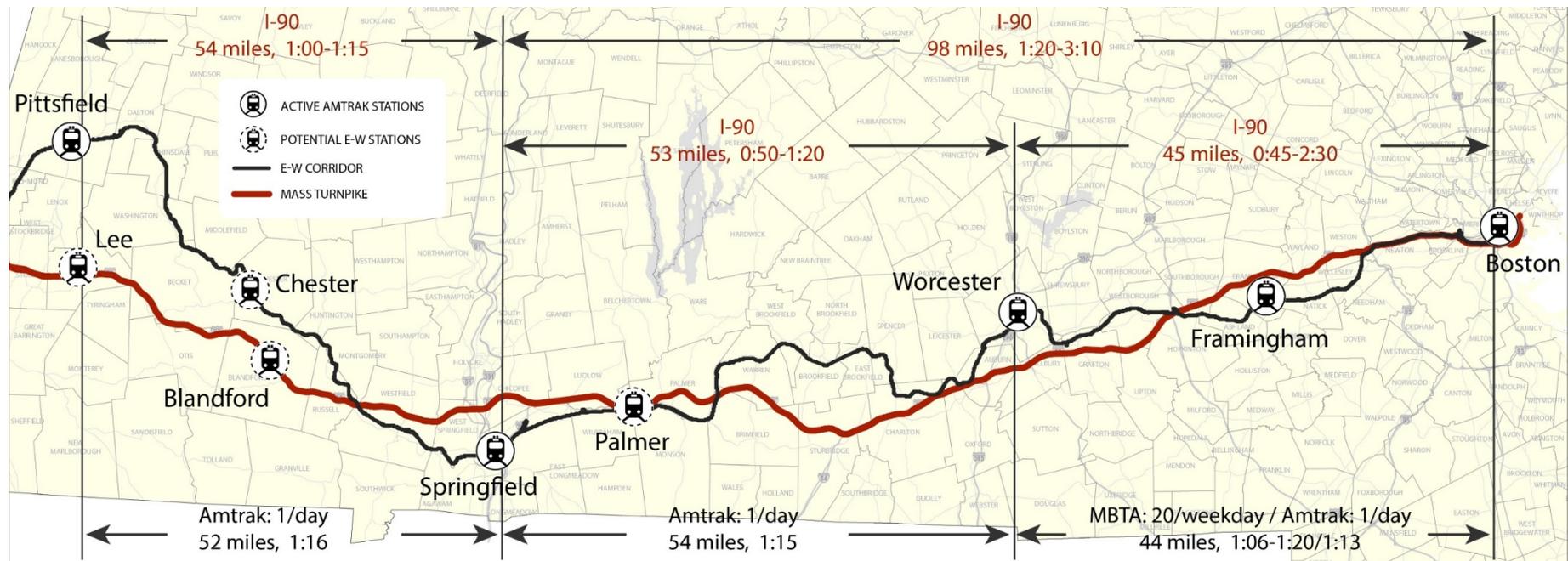
Table 3-5 – Peak Travel Time Indices (AM or PM Peak / Off-Peak)

ORIGIN (ROWS) / DESTINATION (COLUMNS)	PIT	SPG	WOR	BOS
PIT		1.12	1.45	1.83
SPG	1.13		1.73	2.23
WOR	1.44	1.73		2.47
BOS	1.81	2.19	2.39	

These travel time factors are an indicator of congestion levels and auto trip reliability. While auto travel times are relatively unaffected by peak period congestion between Pittsfield and Springfield, significant shifts

in reliability occur for trips with one end located in Worcester or Boston. Figure 3-4 shows typical travel times between the four major markets by automobile and passenger rail.

Figure 3-4 – Travel Time Comparison – Passenger Rail versus I-90 Auto Trips



**Bus Service.** Daily intercity bus service among the East – West Corridor markets is offered by two private service carriers: Greyhound and Peter Pan. Intercity bus stops are available at each of the rail stations in Pittsfield, Springfield, Worcester, and Boston's South Station. Frequent weekday intercity bus connections are provided between the major markets of Springfield, Worcester, and Boston. However, Pittsfield is served by only two weekday round trips to and from Springfield and Boston, and only weekday round trips to and from Worcester. While Boston is the dominant market, with 14 weekday

round trips to and from Worcester and 11 to and from Springfield, a relatively strong connection is also provided between Springfield and Worcester, with seven eastbound and eight westbound trips each weekday. These services include three eastbound and two westbound express bus trips each weekday between Springfield and Boston. One of the two weekday round trips serving Pittsfield requires a bus-to-bus transfer. Based on the published schedules, intercity bus trips between Pittsfield and Boston take approximately 3:40; however, if customers connect to the Springfield-Boston express service, it can be as short

as three hours. Express trips between Springfield and Boston take approximately 1:45, while regular-stop trips take around two hours. Bus trips between Worcester and Boston with local stops can take as long as two hours, but there are many express trips that complete the trip in a single hour. The Pittsfield – Springfield Boston bus route carries approximately 7,800 riders annually, while the Williamstown – Pittsfield – Springfield – Boston route carries approximately 7,100 riders annually;<sup>4</sup> this corresponds to roughly 50 passengers per day on these bus routes.

### 3.4. Corridor Demographics

Demographic conditions and trends are critical to defining the mobility needs and opportunities for communities along the East – West Corridor, as well as determining potential ridership for proposed passenger rail services. Many cities and urban centers in Massachusetts are growing rapidly, in particular those located in the eastern part of the Commonwealth. While Boston and its surrounding “inner core” communities have been experiencing growth, some of the state’s historic gateway cities have experienced stagnant or declining population, especially those farther west. Growth or decline in population and employment can be attributed, in part, to access to jobs and economic opportunity, as well as an increasing preference for urban living among some segments of the population. From a travel demand perspective, the population and employment pull due to the Corridor’s four major cities (Pittsfield, Springfield, Worcester, and Boston) are orders of magnitude greater than what would be produced or attracted in smaller volume markets like Chester.

This section focuses on population and employment trends based on recently published by Massachusetts Regional Planning Agencies

(RPAs), along with data on Environmental Justice (EJ) communities. EJ communities are those areas where the population has a higher level of low-income, limited English proficiency (LEP), and/or federally-defined “minority” status for racial and ethnic identity. These populations were long been subject to disproportionate burdens and deficient benefits from public projects and programs. It is therefore essential to track the location of these EJ populations to enable a better understanding of how a project’s benefits and burdens affect these populations.

Note: Demographic information is given for Corridor communities based on municipal boundaries, as well as for population within a radius of 20 miles around Corridor stations. This second measure, population within a 20-mile radius of a station, corresponds to the people that are most likely to consider riding the East – West service; it is the population use for the ridership forecasting in the alternatives analysis. It includes the population of all US Census tracts that have any portion within 20 miles of the train station site.

**Population.** Based on US Census records, approximately 3.2 million people live within a 20-mile radius of Boston’s South Station, which equates to nearly 47 percent of the Commonwealth’s total population.<sup>5</sup> The second and third most populous travel markets in the East – West Corridor are Worcester, with 836,000 residents and Springfield with 675,000 residents within a 20-mile radius of those stations. Pittsfield is a substantially smaller market, with just under 129,000 residents within a 20-mile radius. When taken together, Pittsfield and Springfield have a residential population of approximately 803,000 within a 20-mile radius of their respective train stations, which is nearly equal to that for Worcester.

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<sup>4</sup> MassDOT Rail & Transit Division, Regional Bus Network Assessment, 2016.

<sup>5</sup> US Census Bureau 2017 American Community Survey 5-Year Estimates at Block Group level.

Based on recent municipal-level population forecasts from Massachusetts RPAs, Figure 3-5 on the next page shows estimates of 2020 population and population density, as well as anticipated change from 2020 to 2040. Between 2020 and 2040, population is expected to increase within Boston, which is anticipated to add nearly 115,000 residents through 2040 (16 percent). Steady population growth is also anticipated in Springfield (9,000 total or 6 percent) and Worcester (7,000 or 4 percent), and Pittsfield (3,350 or 7 percent).

Moving from west to east, 2020 population density is moderate in Pittsfield, decreases to the lowest level in the Corridor between Pittsfield and Springfield, then gradual increases to high density in downtown Springfield. Population density decreases between Springfield and Worcester, where it increases sharply. Population decreases to a moderate level through the MetroWest suburbs, sharply increases around Route 128, then increases significantly to a peak near Boston's South Station.

**Employment.** Based on the same RPA data and forecasts as those for population, Figure 3-6 on page 37 shows estimates of 2020 employment and employment density, as well as anticipated change from 2020 to 2040. The 2020 job density along the Corridor largely mirrors the pattern found with population density: high or moderate in the cities and lower in areas between the cities, with density increasing from west to east for these respective areas.

By 2040, the greatest increase in employment is anticipated in Boston, with 51,000 new through 2040 (an 8 percent increase). Moderate job growth is projected in Worcester (2,450 jobs or 2 percent) over the 20-year period. However, the MPO forecasts anticipate minor employment decreases in Springfield (-250 jobs or -0.3 percent) and Pittsfield (-900 positions or -4 percent).

Figure 3-5 – 2020 and 2040 Population Data (Massachusetts RPAs)

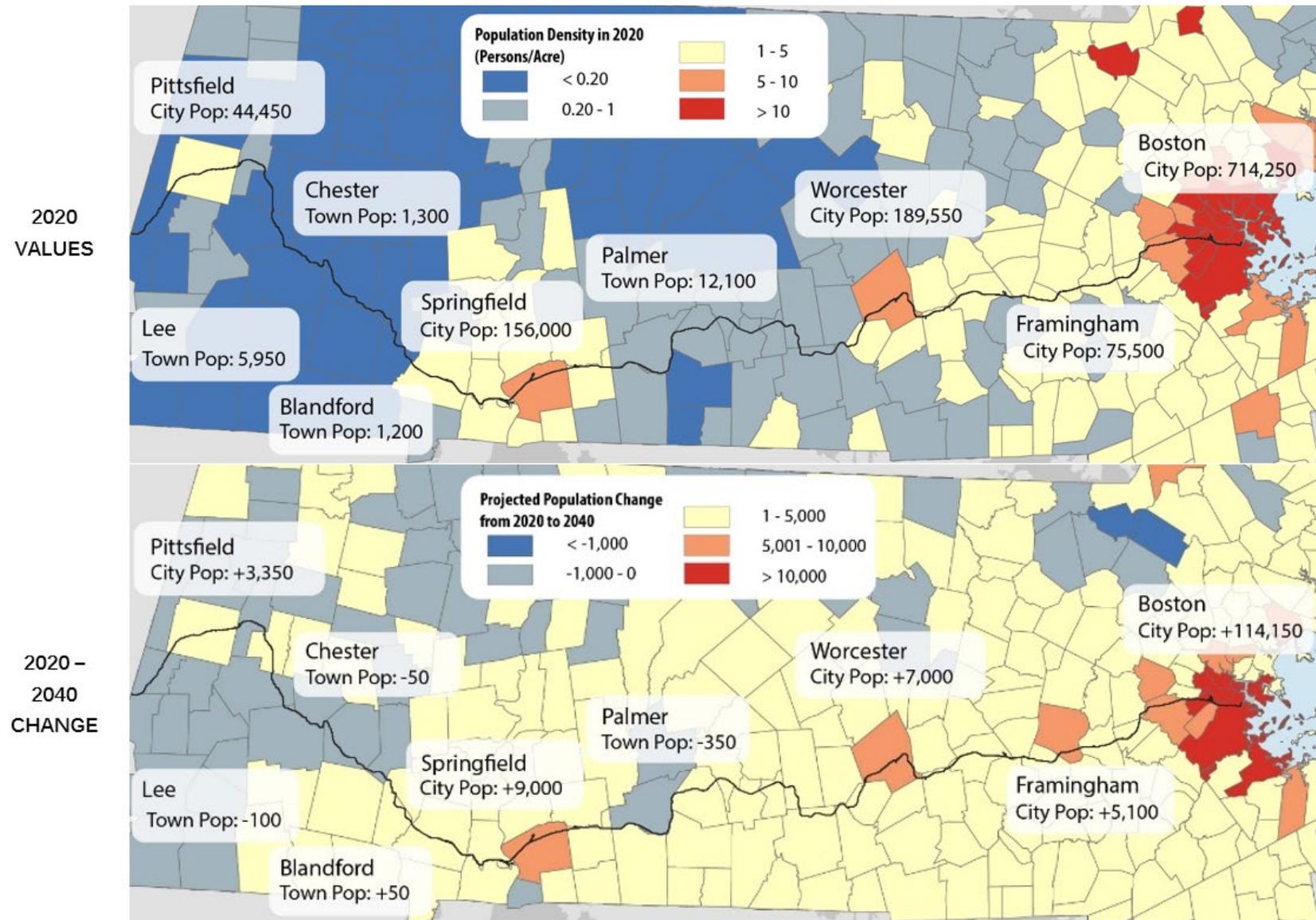
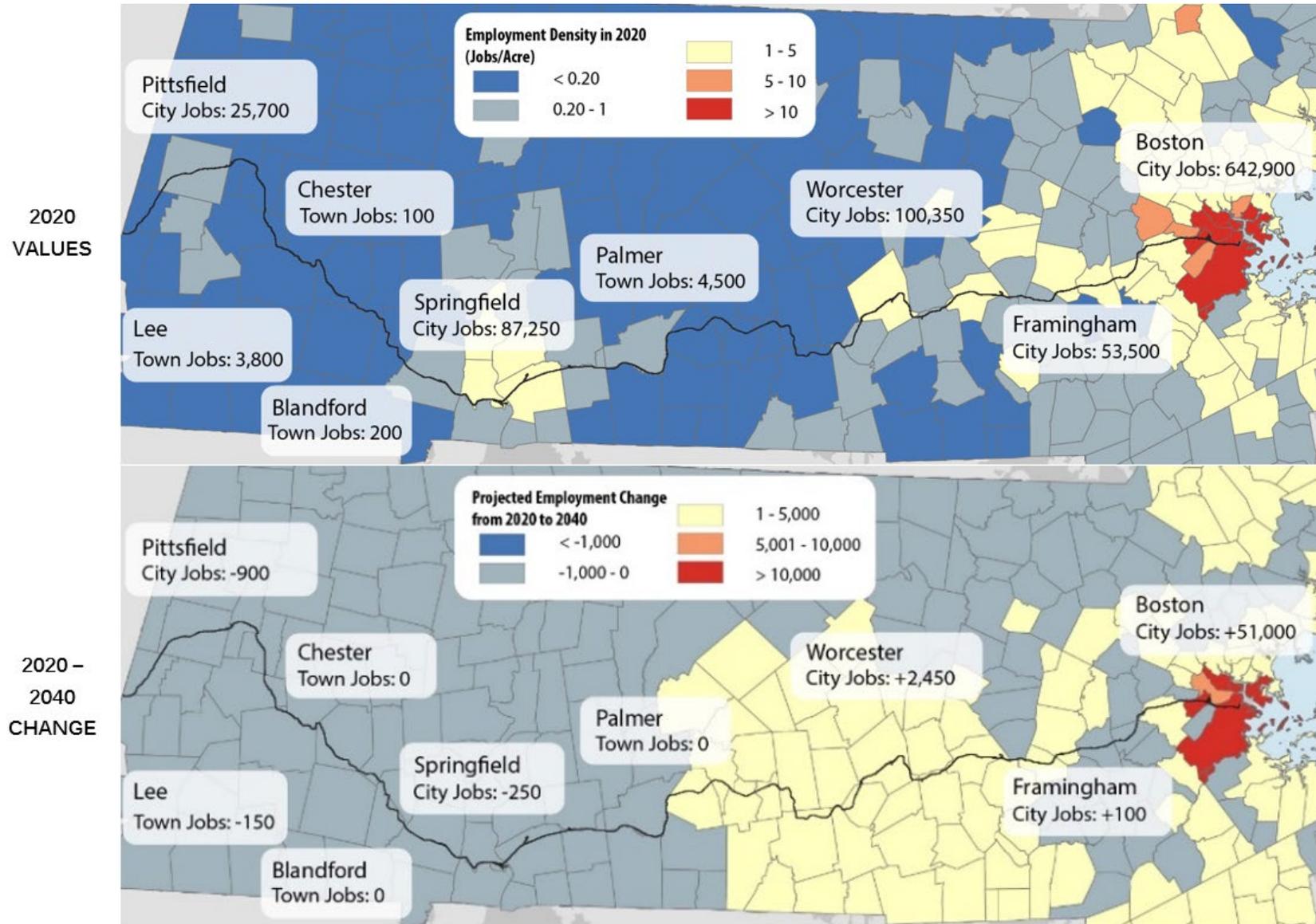


Figure 3-6 – 2020 and 2040 Employment Data (Massachusetts RPAs)



**Environmental Justice (EJ) Communities.** EJ communities are those geographic areas with a residential population that meets certain thresholds set by the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) relative to income, race and ethnicity, and English-speaking status. Meeting any of the three criteria listed in Table 3-6 qualifies an area as an EJ community. These populations are those most at risk of being denied appropriate benefits or bearing disproportionate burdens from governmental decision-making on policies, programs, and projects.

Table 3-6 – Environmental Justice Community Types and Criteria

COMMUNITY TYPE	EJ CRITERION (>= 25% OF SEGMENT)
MINORITY STATUS	Residents are minorities (i.e., not White Alone and not Hispanic)
LOW-INCOME	Households have an annual median income <= 65% of statewide median
LIMITED ENGLISH PROFICIENCY (LEP)	Residents are experiencing English isolation

When accounting for each of the categories, nearly two out of every five (42 percent) Census tracts within the Commonwealth qualifies as some form of an EJ community. For the Minority Status criterion, Springfield and Boston exceed the average, with over one in two tracts qualifying as an EJ Community, while Worcester was somewhat below the statewide average and Pittsfield well below, as seen in Table 3-7. Springfield has a much higher rate of low-income households than the statewide average, while the other three cities are close to that average. The absence of LEP EJ Communities in Pittsfield resulted in substantially lower proportions of EJ Communities than the statewide average.

Table 3-7 – EJ Community Type Data for Four Major Markets

AREA	MINORITY	INCOME	LEP	EJ
PITTSFIELD	7.7%	28.0%	0.00%	28.0%
SPRINGFIELD	37.8%	34.1%	6.5%	46.6%
WORCESTER	27.3%	15.4%	6.2%	30.9%
BOSTON	41.6%	13.9%	5.9%	42.9%
STATEWIDE	32.1%	17.5%	4.4%	36.9%

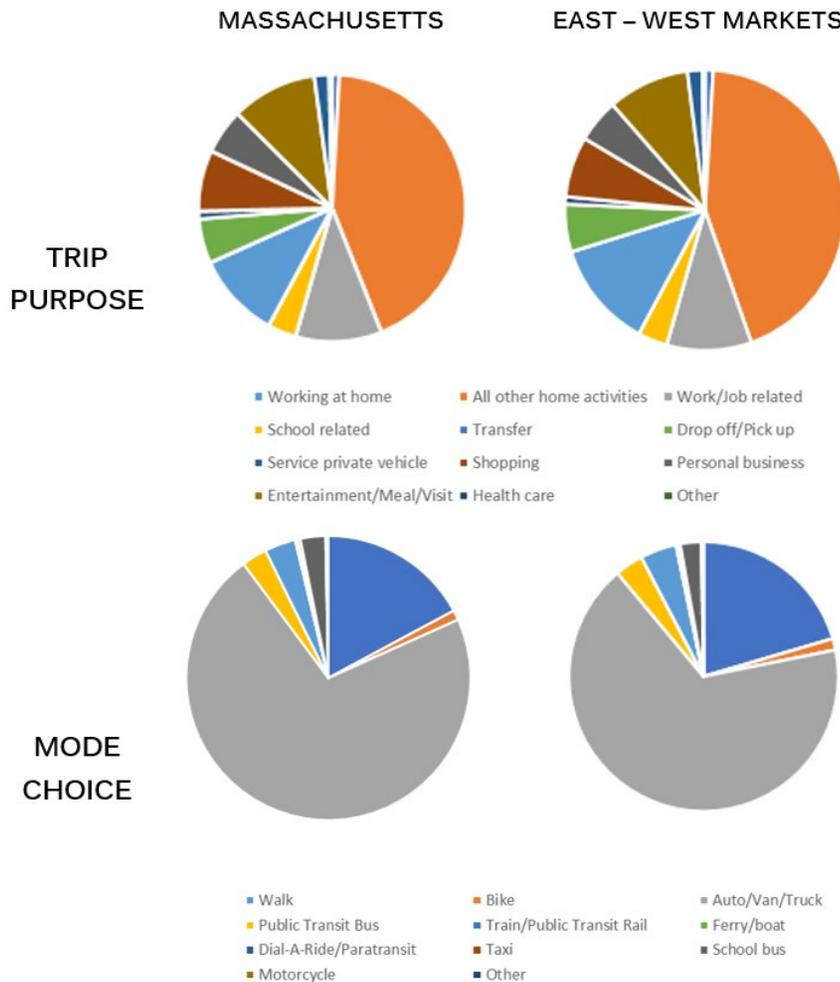
### 3.5. Travel Patterns

The interaction between the transportation system and demographics shapes the travel behavior and patterns for the Commonwealth and the Corridor markets. These travel patterns in turn are critical to developing and evaluating the potential solutions to the rail passenger travel needs in the Corridor. The following assessment of travel patterns is based on data from the statewide household travel survey and identifies major travel patterns along the Corridor, with a specific focus on existing commuting patterns revealed through US Census observations.

Based on records from the 2010 Massachusetts Statewide Travel Survey, Figure 3-7 on the following page summarizes relevant travel demand data among the Corridor markets, including trip purpose and mode split.

**Trip Purpose.** Aside from a slightly greater share of Transfer trips (which typically reflect transit users switching vehicles), the trip purpose distributions for journeys taken by residents of the Corridor markets closely track those of all trips in Massachusetts. At both the state and Corridor level, home-based trips accounted for the greatest share of all journeys taken at around 40 percent while work-based trips represented approximately 10 percent. Trips taken for Social/Recreational, Personal Business, or Shopping purposes typically ranged from 10 to 15 percent of reported journeys.

Figure 3-7 – Trip Purpose and Mode Choice for Trips Among Corridor Markets (2010 Statewide Household Travel Survey)



**Mode Split.** Residents of the East – West Corridor markets are more likely to travel by modes other than automobile, particularly along the densely developed Worcester-Boston segment. While 70 percent of trips reported in the Commonwealth were completed by automobile,

the share of automobile-based trips made by Corridor residents within a 20-mile radius of the train stations was about 4.5 percentage points lower. This is because the Corridor encompasses the Commonwealth’s largest cities with the densest land uses, the most robust transit and multimodal networks, and greater concentrations of lower-income, transit dependent populations. As a result, Corridor residents are better able to substitute Walking, Public Transit Rail, Public Transit Bus, or Biking for car-based journeys. Compared to the statewide share of transit-based trips, the tendency to use transit was 24 percent higher among Corridor residents, with 10 percent of all trips taken by rail or bus.

**Travel Demand Patterns.** The following are key patterns and trends related travel demand in the East – West Corridor, based on data from the 2010 Statewide Household Travel Survey (HHTS) and the US Census Bureau’s Longitudinal-Employer Household Dynamics (LEHD) dataset.

- **Statewide Travel Survey Patterns.** Table 3-8 on the next page shows the relative flow of residents living within 20 miles of a Corridor train station for all trip purposes, based on the HHTS. In general, attraction between the markets increases as the distance separating them decreases. In terms of magnitude, strong connections were observed between Worcester and Boston (320,700 trips). Ties between Springfield and Worcester (24,400 trips) and Pittsfield and Springfield (16,300 trips) made up the majority of the remainder. The following are some of the other travel patterns identified.

Table 3-8 – Relative Proportion of Travel Demand among the Corridor Markets for All Trip Purposes (2010 MA Statewide Travel Survey)

ORIGIN (ROWS) / DESTINATION (COLUMNS)	PIT	SPG	WOR	BOS	ALL
PIT		3%	<1%	<1%	4%
SPG	1%		3%	1%	5%
WOR	<1%	3%		63%	66%
BOS	<1%	3%	21%		25%
ALL	2%	10%	24%	64%	100%

- Of the trips among the East – West Corridor cities reported through the HHTS, nearly two-thirds (63 percent) have origins in Worcester and destinations in Boston.
- Trips with origins in Boston are most strongly attracted to Worcester.
- Residents of Pittsfield are mostly attracted to Springfield, and much less so to markets farther east.
- Springfield residents are mostly attracted to Worcester and showed same level of attraction to Pittsfield and Boston (about 1 percent to each).

Table 3-9 summarizes commuting activities between the Corridor markets. Of all the trips between the Corridor markets, 30 percent of the traffic, or roughly 114,100 trips, were completed for work purposes. Trip purpose is implicitly assumed within the base ridership forecasts, which initially used the CT *rail* Hartford Line stations as proxy pairs.

Table 3-9 – Commute Trips as Proportion of All Trips between Corridor Markets (2010 MA Statewide Travel Survey)

MARKET	WORK TRIPS FROM AS SHARE OF ALL TRIPS BETWEEN CORRIDOR MARKETS	WORK TRIPS TO AS SHARE OF ALL TRIPS BETWEEN CORRIDOR MARKETS
PITTSFIELD	11%	15%
SPRINGFIELD	27%	13%
WORCESTER	33%	27%
BOSTON	24%	34%
ALL	30%	30%

- **US Census Travel Patterns.** The US Census Bureau's LEHD dataset provides detailed origin-destination information for commute trips across the country. Using a 20-mile radius, the LEHD analysis identified approximately 237,000 commute trips among the Corridor markets. Table 3-10 on the next page summarizes the relative flows of commuters who live within 20 miles of one Corridor market (rows) and work in another (columns). Table 3-11 shows the degree to which connections to the other Corridor markets contribute to each market's local economy, either by providing residents with wages earned elsewhere (left column) or filling positions available locally (right column).

Table 3-10 – Relative Commute Flows among the Corridor Markets (US Census LEHD)

HOME (ROWS) / WORK (COLUMNS)	PIT	SPG	WOR	BOS	ALL
PIT		2%	1%	2%	4%
SPG	1%		5%	9%	15%
WOR	0%	5%		47%	52%
BOS	1%	5%	22%		28%
ALL	2%	12%	28%	57%	100%

Table 3-11 – Relative Employment Ties among the Corridor Markets as a Share of Total Employment (US Census LEHD)

MARKET	WORK TRIPS TO OTHER CORRIDOR MARKETS AS SHARE OF ALL COMMUTES FROM MARKET	WORK TRIPS FROM OTHER CORRIDOR MARKETS AS SHARE OF ALL COMMUTES TO MARKET
PITTSFIELD	19%	11%
SPRINGFIELD	14%	12%
WORCESTER	31%	18%
BOSTON	4%	7%
ALL	7%	7%

- More than half of the work trips (52 percent) originated in Worcester, with 15 percent beginning in Springfield and 28 percent in Boston.
- More than half of the work trips (57 percent) between Corridor markets were bound for Boston, with 28 percent destined for Worcester and 12 percent for Springfield.

- Two percent of work trips were bound for Pittsfield, whose workers were responsible for four percent of commute trips among the Corridor markets.
- Given their proximity and Boston’s strong economy, the Worcester – Boston market pair accounted for nearly three quarters (69 percent) of commute trips.
- Springfield’s relatively strong employment connections (both ways) with Worcester (10 percent) and Boston (14 percent) suggest potential demand for enhanced travel connections.
- Connections between Pittsfield and the Corridor markets made up 6 percent of all commute trips (4 percent from Pittsfield, 2 percent to Pittsfield).
- The Boston-bound commutes from Worcester and Springfield accounted for more than half (56 percent) of all commutes between the Corridor markets.

Table 3-12 and Table 3-13 on the following page show how each Corridor market contributes to economic activity. The first table shows the relative proportion of work location based on home location (i.e., 48 percent of residents living in other Corridor markets who reported to work in Pittsfield came from Springfield). The second table displays the relative proportion of home locations based on work location (i.e., 8 percent of workers who commuted from Springfield to other Corridor markets went to Pittsfield).

Table 3-12 – Relative Proportion of Worker Home Locations Based on Employment Location (US Census LEHD)

HOME (ROWS) / WORK (COLUMNS)	PIT	SPG	WOR	BOS
PIT		15%	3%	3%
SPG	48%		18%	16%
WOR	18%	42%		81%
BOS	33%	43%	79%	
ALL	100%	100%	100%	100%

Table 3-13 – Relative Proportion of Employment Location Based on Worker Home Location (US Census LEHD)

HOME (ROWS) / WORK (COLUMNS)	PIT	SPG	WOR	BOS	ALL
PIT		42%	18%	40%	100%
SPG	8%		33%	59%	100%
WOR	1%	10%		89%	100%
BOS	3%	19%	78%		100%

### 3.6. Issues and Opportunities

The following is a summary of the key issues and opportunities that the existing conditions in the East – West Corridor present for developing and evaluating potential East – West passenger rail infrastructure and service options.

- New England has many passenger rail lines with robust service and strong ridership, including both commuter rail and intercity

passenger rail. However, since all Amtrak Northeast Corridor service was shifted away from the Inland Route to the electrified Shore Line in 2004, passenger rail service for Pittsfield and Springfield has been limited to only one daily round trip via the Amtrak *Lake Shore Limited*.

- Two potential corridors were identified for providing passenger rail connections to the East – West service communities: the Boston – Albany rail mainline and the I-90/Massachusetts Turnpike corridors. Either corridor would require significant infrastructure improvements to enable frequent passenger rail service.
- Boston Albany Rail Mainline
  - West of Worcester, this rail line is owned by CSX, the third largest freight railroad in North America and the largest operating in New England. Implementing and operating increased passenger rail in this corridor would require an agreement for sharing the corridor.
  - The section of the rail corridor west of Worcester has not been maintained to the high levels required for frequent passenger service, and it includes many segments where the second track has been removed from the line: the 52-mile Springfield to Pittsfield segment of the corridor includes 13.5 miles of single-track rail alignment, and the Worcester to Springfield segment includes mostly single-track rail alignment, with 33 miles of single track and only 21 miles of double-track.
  - East of Worcester, the rail line is owned by MassDOT and MBTA, and use principally for high-frequency commuter rail service on the Framingham/Worcester Line, which provides 28 inbound weekday trains, 26 outbound weekday trains. The track infrastructure in this segment is in very good physical condition, but is heavily used by existing rail traffic.
- I-90/Massachusetts Turnpike Corridor
  - This corridor generally provides a straighter and wider alignment than the Boston – Albany rail mainline.

- The I-90 corridor currently provides no railroad infrastructure; all new railroad infrastructure would need to be built.
- The I-90 corridor does not provide direct access to existing downtown train stations in the East – West Corridor communities; new rail links would need to be provided, most likely via short connecting segments on the Boston – Albany mainline.
- The I-90 corridor has significant width constraints inside of Route 128/Interstate 95, and could not accommodate a new passenger rail alignment in this segment.
- The East – West Corridor includes the communities with the highest population and employment in each part of the Commonwealth: western Massachusetts (Pittsfield and Springfield), central (Worcester), and eastern (Boston).
- Travel Patterns – Based on the Massachusetts Statewide Household Travel Survey, conducted in 2010 – 2011.
  - Of all trips among the four major cities in the Corridor, a large majority (84 percent) are between Worcester and Boston. This is likely due to the fact that these are the largest cities in the Commonwealth; there are more travel options, including frequent commuter rail service; Pittsfield and Worcester are significantly farther from Boston, the largest population and employment center; and highway congestion in eastern Massachusetts can be a significant barrier, especially for longer trips from the western part of the Commonwealth. Other example corridors such as the 91-mile long Philadelphia to New York corridor have very competitive rail service due to large historic investments in rail infrastructure and high quality service.
  - Work-related travel accounted for about 30 percent of all trips among the cities in the East – West corridor.
- Work trips generally follow similar patterns to overall trips, with the level of trip-making proportional to the size and proximity of the cities.